TIME-INTERVAL COLLECTING DEVICE FOR INSECT TRAPS

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TIME-INTERVAL COLLECTING DEVICE FOR INSECT TRAPS

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INTRODUCTION

In surveying nocturnal insects it is often desirable to determine the time of night that a particular insect species is most active. The construction and operation of a programmable time-interval collecting device for use with insect traps is described in this report. The device continuously receives insects from a trap over a 12-hour period. A fresh collection container is automatically positioned under the trap each hour. Twelve hourly intervals cover nocturnal insect activity nicely. The device requires little attention from the operator when it is properly built, installed, and adjusted. It should be equally valuable for surveying diurnal insects when properly adapted to the trap being used.

The collecting device was originally designed for use with a gravity black-light trap having a funnel diameter of 18 inches. It can be used with other sizes of light traps, such as the standard survey trap[3] with a funnel diameter of 14 inches, or with an electric-grid trap having a 24-inch-diameter funnel. With different sized funnel diameters, the position of the inlet from the trap is varied as shown in figure 1.

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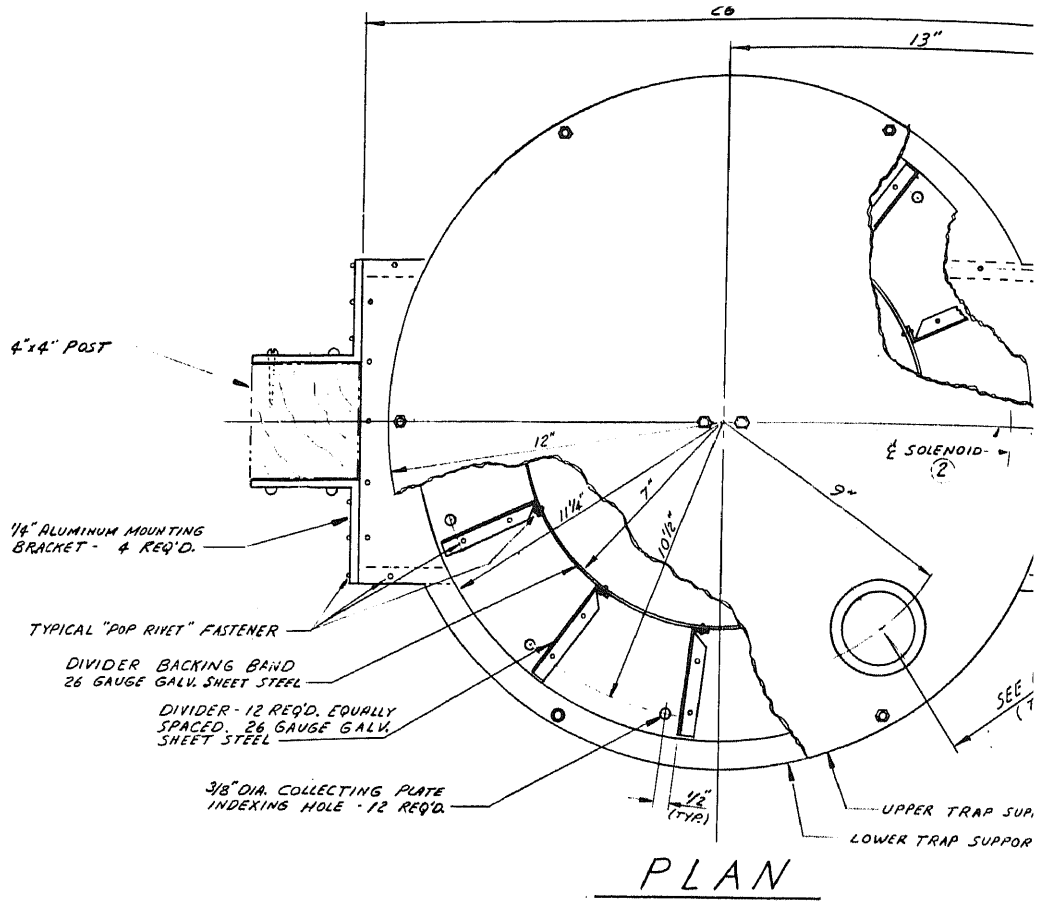
[3] Harding, W. C., Hartsock, J. G., and Rohwer, G. G. Blacklight trap standards for general insect surveys. Bull. Entomol. Soc. Am. 12(1): 31-32. 1966.

DESIGN AND OPERATION

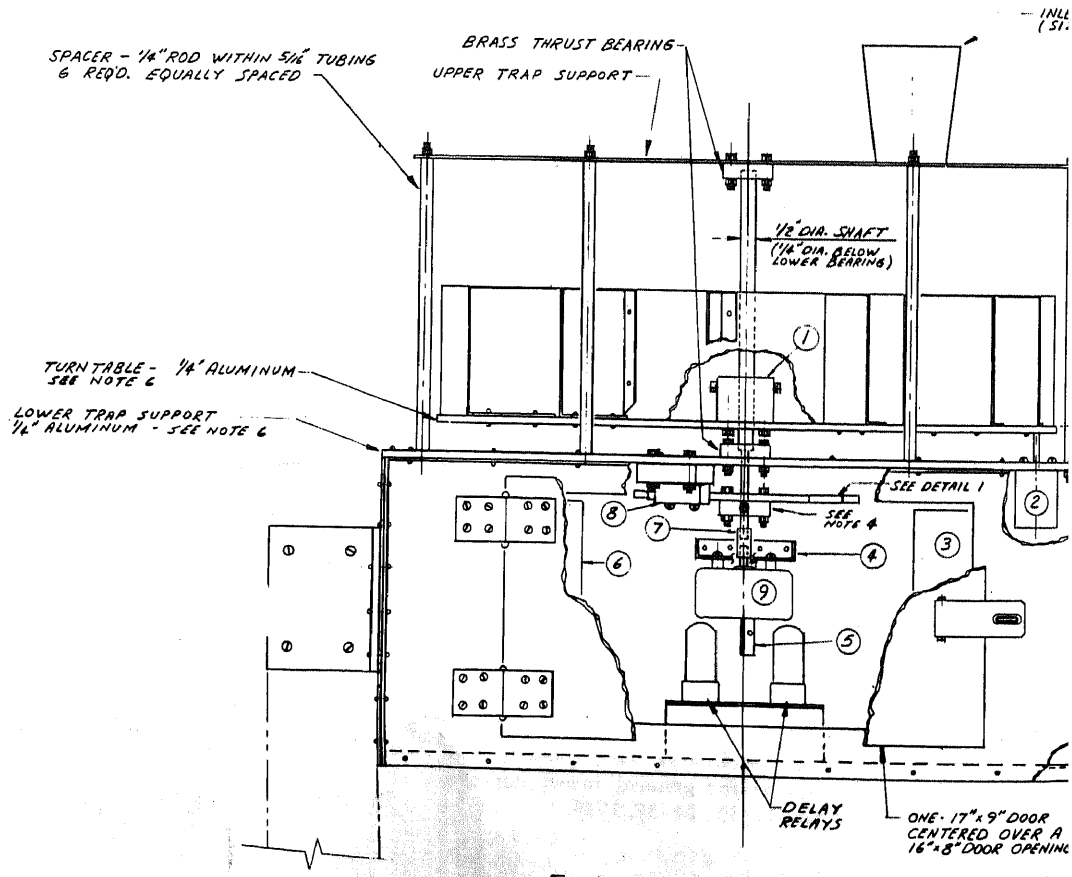
The collecting device is shown in figure 2 as used with a gravity black-light trap. The complete unit is mounted on two 4- by 4-inch posts. The electrical parts are listed in the table.

The upper trap support consists of a disk of No. 18 gage galvanized sheet metal, or other suitable material, to which the trap is mounted. The disk also serves as a roof for the collection containers. A turntable positions the collection containers under the trap funnel at the programed time. The turntable is secured to a vertical shaft supported by a brass collar-type thrust bearing mounted on the lower trap support. An inverted brass thrust bearing mounted on the upper trap support is used for centering the turntable. Directly beneath the lower trap support, a cam wheel is also mounted on the turntable shaft. Twelve equally spaced cams are cut on the periphery of the cam wheel to operate the snap-action switch controlling the twelve 1-hour intervals. A 1-r/min, 120-volt, a. c. motor is mounted beneath the cam wheel. The turntable shaft is connected directly to the motor shaft. The motor and controls are protected from the weather by being located beneath the lower trap support.

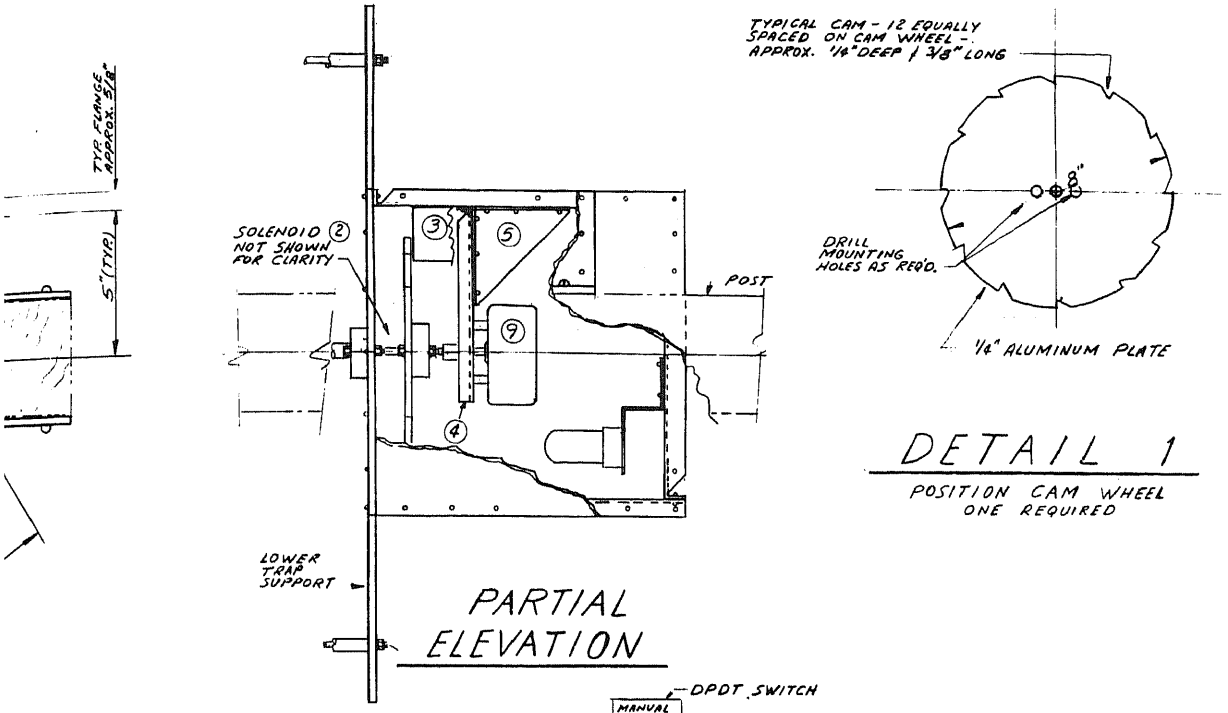
The height of the collection container used determines the distance between the bottom of the upper trap support and the turntable. Large-mouth glass jars or metal cans work well as collection containers, but spacers are needed to hold small-diameter containers in the center of each turntable section. A 1/4-inch clearance between the container and the upper trap support seems to be adequate. However, this clearance can be decreased as long as there is no binding between the top of the container and the sup-

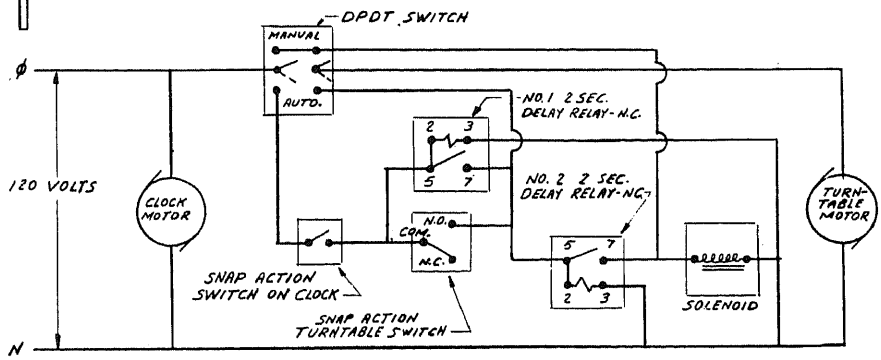


PLAN



ELEVATION





SCHEMATIC WIRING DIAGRAM

NO SCALE

(1) = TURNTABLE TO SHAFT MOUNTING / POSITIONING DEVICE-ALUMINUM
(2) = TURNTABLE INDEXING SOLENOID-NORMALLY EXTENDED
(3) = TIMER
(4) = TURNTABLE MOTOR SUPPORT BRACKET
(5) = TURNTABLE MOTOR SUPPORT BRACKET BRACE
(6) = MAIN SWITCH
(7) = FLEXIBLE COUPLING
(8) = SNAP ACTION TURNTABLE SWITCH
(9) = ONE R.P.M TURNTABLE MOTOR

GENERAL NOTES

1. ALL SHEET METAL TO BE 18 GAUGE GALVANIZED SHEET STEEL UNLESS NOTED.
2. DIMENSIONS, THICKNESSES / MATERIALS MAY BE VARIED TO SUIT CIRCUMSTANCES.
3. THIS DIMENSION DETERMINED BY HEIGHT OF COLLECTION CONTAINERS. CONTAINERS SHOULD NOT RUB UPPER PLATE.
4. WELD OR BOLT COLLAR TO CAM WHEEL. COLLAR USED TO POSITION AND SECURE CAM WHEEL TO TURNTABLE SHAFT. COLLAR TAPPED FOR TWO SETSCREWS.
5. DIMENSION TO BE ONE HALF THE TRAP FUNNEL DIAMETER.
6. OTHER SUITABLE NON-WARPING MATERIAL MAY BE USED IN PLACE OF ALUMINVM.

SCALE: ⊢—⊣ = 1"

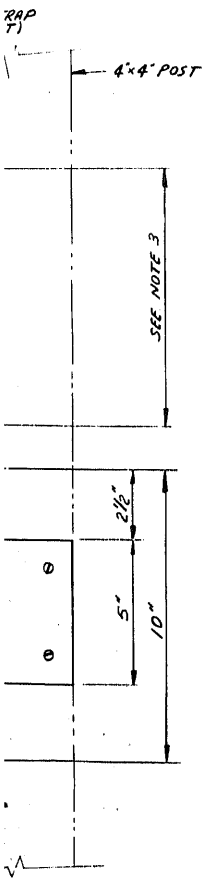


Figure 1.—Schematic of time-interval collecting device.

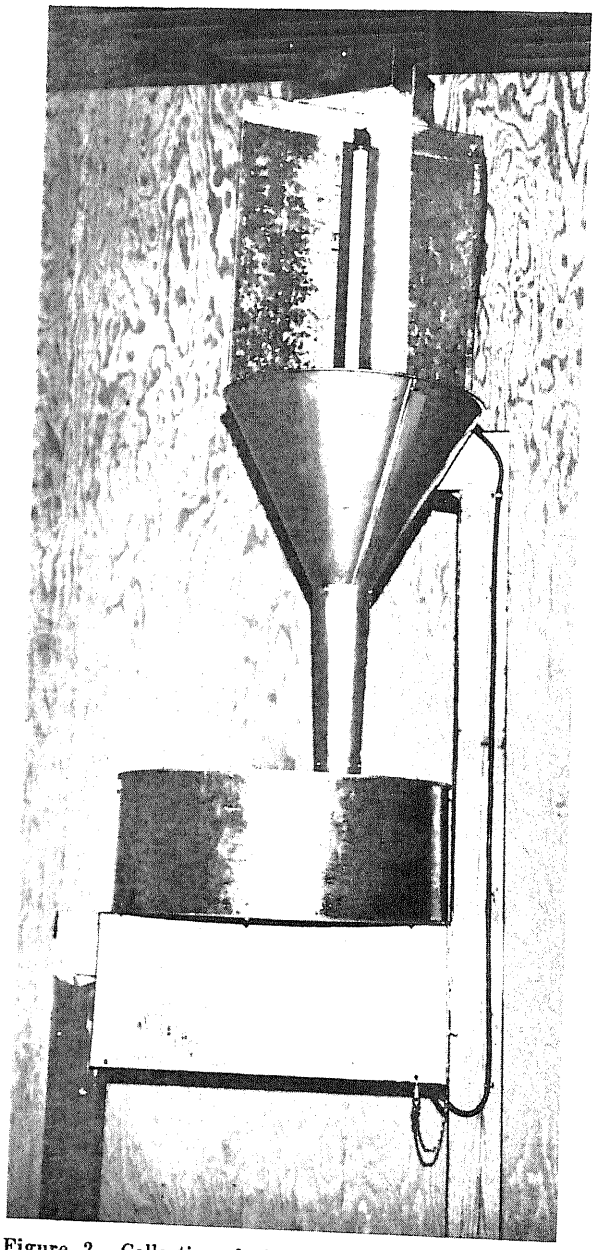


Figure 2.—Collecting device mounted beneath funnel assembly of gravity black-light insect trap.

port. The escape of small insects can be reduced by using an insect killing agent in each container.

The control system, shown schematically in figure 1, consists of a 24-hour clock with "on" and "off" controls that permit cycling within a 12-hour period. This feature can be incorporated on less expensive clocks by filing cams at intervals on the rotating clock dial and installing a snap-action switch to be operated by these cams. A double-pole, double-throw switch is used to control the turntable manually for installing (removing collection containers. In automatic p sition this switch controls the operation of tl turntable at hourly intervals. With the switc in the manual position, all controls for the tur table motor are bypassed. In automatic positio the snap-action switch on the clock controls th circuit to a second snap-action switch on the car wheel and also to a 2-second time-delay rela wired in parallel with the cam wheel snap-actio switch. When the clock switch closes, the can wheel switch is in the normally open position and the No. 1 delay relay completes the circui until the turntable has moved a sufficient dis tance to pull the snap-action switch lever out o the cam, closing the contacts which complete th circuit through the switch. While the turntabl is moving to the next cam, the No. 1 delay relay contacts open. When the cam wheel switch leve engages the next cam, the circuit is broken to the turntable motor and kept open by the delay relay until the clock switch deenergizes the circuit.

At the instant the motor is energized and during the travel period of the turntable, the circuit through the closed contacts of No. 1 relay or the cam wheel switch energizes another 2-second delay relay (No. 2) whose contacts are in series with a solenoid. This allows the solenoid to immediately withdraw a locking plunger from an indexing hole in the turntable plate, permitting it to turn. During the turntable travel to the next cam, the No. 2 relay contacts open, deenergizing the solenoid and permitting its plunger to slide into the next positioning hole upon arrival. The locking plunger holds the turntable in position, thus preventing forced manual rotation, which can damage the turntable mounting on the vertical shaft. Twelve accurately placed holes are required in the turntable. The contacts of No. 1 relay close again only after the clock switch opens, permitting the relay heater to cool. At this point the unit is ready to repeat the cycle when the clock switch contacts again close at the desired time.

The turntable can be completely enclosed by a metal housing as shown in figure 2, with a service door being provided as shown in figure 3. This enclosure requires that the collection containers be handled in a definite sequence. It also prevents birds from building nests in the center of the turntable.

Electrical Parts List[1]

Part	Quantity	Description
Turntable motor	1	1-r/min, 1/250-hp, 115-V, 0.32-A, 60-Hz. W. W. Grainger, Inc., stock No. 3M095 or equal.
Timer	1	24 h/cycle. Minimum of 2 on-off trippers/h, 115- to 125-V, 60-Hz. W. W. Grainger, Inc., stock No. 2E026 or equal.
Main switch	1	120-V, 30-A, fusable. W. W. Grainger, Inc., stock No. 4X454 or equal.
Solenoid	1	120-V, 60-Hz, intermittent duty, 1-inch stroke with 80-oz lift at maximum stroke. Allied Electronics, stock No. 802-1104 or equal.
Turntable switch	1	15-A, 120-V, Micro Switch BZ-2RL2-A2 or equal.
Double-pole, double-throw switch	1	15-A, 120-V, Arrow-Hart on-off-on. Allied Electronics, stock No. 717-0544 or equal.
Delay relay	2	120-V, 3-A contacts. Amperite thermal relay No. 115C2 or equal.
Delay relay socket	2	Amphenol standard octal socket No. 77 M1P8 or equal.

[1] Trade names are used in this publication solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture or an endorsement by the Department over other products not mentioned.

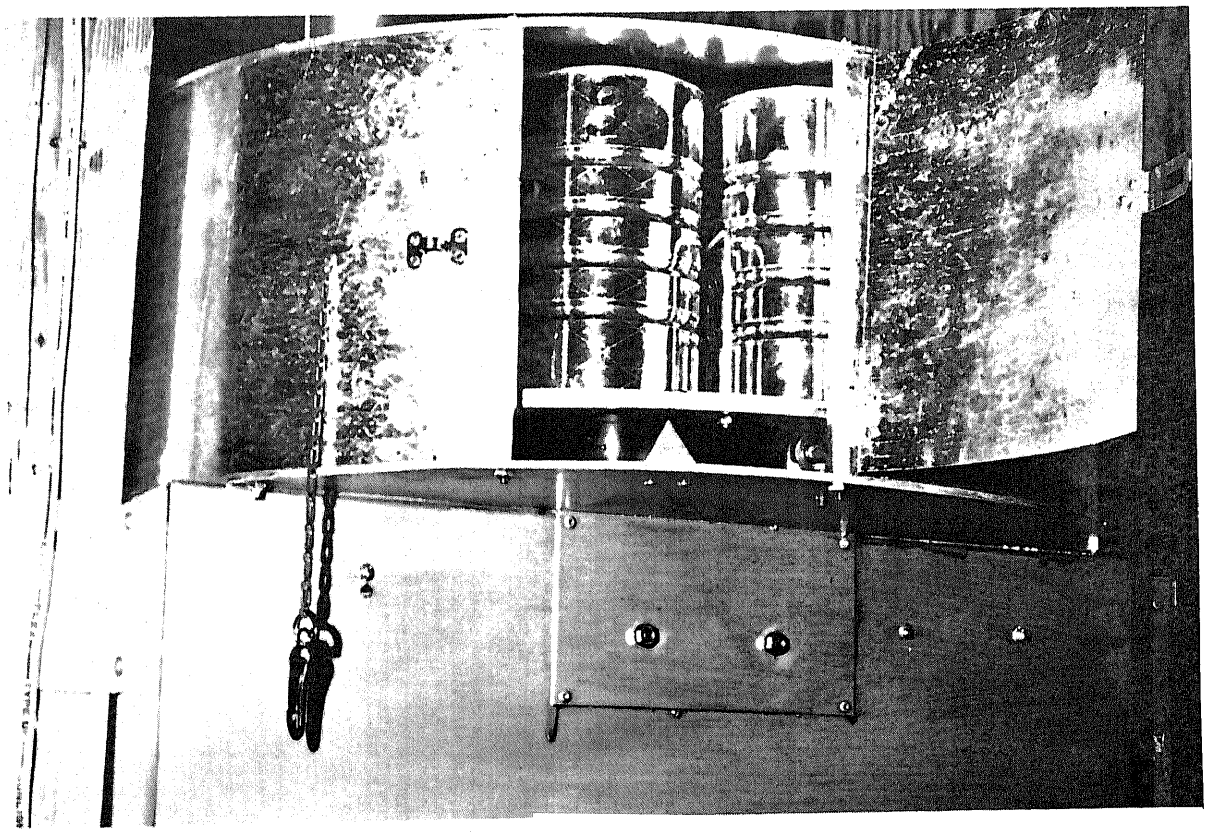


Figure 3.—Closeup of collecting device w